

Ch 4 Matrices

4-1 Intro to Matrices

Each value is called an element

Matrix--a rectangular array of variables or constants in horizontal rows and vertical columns, enclosed in brackets.

$$A = \begin{bmatrix} 3 & 2 & 1 & -2 \\ 5 & -4 & 6 & 11 \\ -4 & 9 & 0 & 1 \end{bmatrix}$$

How are matrices used to make decisions?

Subrina wants to buy a sports-utility vehicle (SUV). There are many types of SUVs in many prices and styles. So, Subrina makes a list of the qualities for different models and organizes the information in a matrix.

	Base Price	Horsepower	Towing Capacity (lb)	Cargo Space (cu ft)	Fuel Economy (mpg)
Large SUV	\$32,450	285	12,000	46	17
Standard SUV	\$29,115	275	8700	16	17.5
Mid-Size SUV	\$27,975	190	5700	34	20
Compact SUV	\$18,180	127	3000	15	26.5

Source: Car and Driver's Guide

When the information is organized in a matrix, it is easy to compare the features of each vehicle.

The matrix to the right from p.154 in your text shows the organization of different SUVs.

4

How many rows are there?

5

How many columns are there?

Row matrix--only one row $[3 \ 5 \ -2]$

Column matrix--only one column $\begin{bmatrix} 0 \\ -8 \end{bmatrix}$

Square matrix--same number of rows as columns

Zero matrix--every element is zero

$$\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$$

$$\begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

Equal Matrices--same dimensions; each element is = to the corresponding elements

$$\begin{bmatrix} 4 & 3 & 7 \\ -2 & 6 & 1 \end{bmatrix} = \begin{bmatrix} 4 & 3 & 7 \\ -2 & 6 & 1 \end{bmatrix}$$

$$\begin{bmatrix} 4 & 3 & 7 \\ -2 & 6 & 1 \end{bmatrix} \neq \begin{bmatrix} 4 & -2 \\ 3 & 6 \\ 7 & 1 \end{bmatrix}$$

Solving equations involving matrices

Examples:

The following 2 x 2 matrices are equal.

$$\begin{bmatrix} 8 & -10 \\ 2y & 24 \end{bmatrix} = \begin{bmatrix} x+3 & z \\ 7 & 24 \end{bmatrix}$$

The following 2 x 1 matrices are equal.

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} y-9 \\ 2x+13 \end{bmatrix}$$

$$\begin{aligned} x &= y-9 \\ y &= 2x+13 \end{aligned}$$

(-4, 5)

WEATHER For Exercises 8 and 9, use the table that shows a five-day forecast indicating high (H) and low (L) temperatures.

8. Organize the temperatures in a matrix.

9. What are the dimensions of the matrix?

Fri	Sat	Sun	Mon	Tue
H 88	H 88	H 90	H 86	H 85
L 54	L 54	L 56	L 53	L 52

Homework

p156-157

10-16, 18-21, 25-27

$$\begin{array}{l} \text{High} \\ \text{Low} \end{array} \begin{bmatrix} \text{F} & \text{Sa} & \text{Su} & \text{M} & \text{T} \\ 88 & 88 & 90 & 86 & 85 \\ 54 & 54 & 56 & 53 & 52 \end{bmatrix}$$